Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification										DATE: February 2010	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602618A: *BALLISTICS TECHNOLOGY*							
COST ($ in Millions)	**FY 2009 Actual**	**FY 2010 Estimate**	**Base FY 2011 Estimate**	**OCO FY 2011 Estimate**	**Total FY 2011 Estimate**	**FY 2012 Estimate**	**FY 2013 Estimate**	**FY 2014 Estimate**	**FY 2015 Estimate**	**Cost To Complete**	**Total Cost**
Total Program Element	84.827	78.034	60.342	0.000	60.342	59.623	62.176	65.816	70.640	0	541.800
H03: *ROBOTICS TECHNOLOGY*	15.929	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
H75: *ELECTRIC GUN TECHNOLOGY*	4.465	4.065	0.032	0.000	0.032	0.045	0.065	0.072	0.092	Continuing	Continuing
H80: *Survivability and Lethality Technology*	50.367	57.456	60.310	0.000	60.310	59.578	62.111	65.744	70.548	Continuing	Continuing
HB1: *SURVIVABILITY AND LETHALITY TECHNOLOGIES (CA)*	14.066	16.513	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program element (PE) provides ballistic technologies required for armaments and armor that will enable enhanced lethality and survivability for the Soldier. The PE supports applied research on autonomous mobility technology for future land combat systems (project H03); applied research on technologies for electric armaments and penetrators that offer the potential to achieve leap-ahead lethality capability by providing hypervelocity and hyper-energy launch well above the ability of the conventional cannon (project H75); and applied research on lightweight armors and structures for the Soldier and vehicles, kinetic energy active protection, crew and component protection from ballistic shock and mine-blast, insensitive propellants/munitions, novel multi-function warhead concepts, affordable precision munitions technologies, and physics-based techniques, methodologies, and models to analyze combat effectiveness of future technologies (project H80). Project HB1 funds congressional special interest items. Work in this PE is related to and fully coordinated with efforts in PE 0602105A (Materials Technology), PE 0602120A (Sensors and Electronic Survivability), PE 0602601A (Combat Vehicle and Automotive Technology), PE 0602624A (Weapons and Munitions Technology), PE 0602705A (Electronics and Electronic Devices), PE 0602716A (Human Factors Engineering), PE 0602782A (Command, Control, Communications Technology), PE 0603004A (Weapons and Munitions Advanced Technology), and PE 0603005A (Combat Vehicle Advanced Technology). The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan. Work in this PE is performed by the Army Research Laboratory (ARL), Aberdeen Proving Ground, MD and Hampton, VA.

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B. Program Change Summary ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
Previous President's Budget	87.960	61.843	62.140	0.000	62.140
Current President's Budget	84.827	78.034	60.342	0.000	60.342
Total Adjustments	-3.133	16.191	-1.798	0.000	-1.798
• Congressional General Reductions		-0.409			
• Congressional Directed Reductions					
• Congressional Rescissions		0.000			
• Congressional Adds		16.600			
• Congressional Directed Transfers					
• Reprogrammings	-1.610	0.000			
• SBIR/STTR Transfer	-1.523	0.000			
• Adjustments to Budget Years	0.000	0.000	-1.798	0.000	-1.798

Change Summary Explanation

FY10 Congressional directed increases.

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COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	Base FY 2011 Estimate	OCO FY 2011 Estimate	Total FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
H03: *ROBOTICS TECHNOLOGY*	15.929	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

THIS PROJECT MOVED TO PE 0602120A/PROJECT TS2 BEGINNNING IN FY10.This project funds applied research on autonomous mobility. The research focuses on investigation of advanced perception for autonomous ground mobility, intelligent vehicle control and behaviors; and human supervision of unmanned ground systems. Research results will enable both semi-autonomous and near autonomous unmanned ground vehicles (UGVs) with products transitioning to advanced development efforts. The work within this project provides the basis for the Collaborative Technology Alliance (CTA) in robotics. The applied research conducted in this program will be transitioned to technology development, demonstration, and materiel acquisition programs being conducted by the Office of the Secretary of Defense Joint Robotics Program and each of the Services. Work in this PE is related to and fully coordinated with efforts in PE 0603005A (Combat Vehicle Advanced Technology). The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.Work in this project is performed by the Army Research Laboratory (ARL), Aberdeen Proving Ground, MD and Hampton, VA.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Program #1	7.220	0.000	0.000	0.000	0.000
CTA: Execute CTA for advanced perception, control/behavior, and man-machine interface technology required for high-speed mobility (including robotic-follower operations) and basic tactical behaviors common to multiple military missions. Research focuses on new sensor and sensor processing algorithms for rapid detection and classification of objects in the environment enabling safe high-speed mobility and intelligent tactical behavior by future unmanned systems; implementing adaptive control strategies that will enable unmanned systems to display intelligent tactical behavior, and development of human-robot interaction (HRI) scalable, intuitive, multi-modal control interfaces that will minimize the additional cognitive workload for Soldiers controlling unmanned assets. In FY09, developed technology for scene understanding and autonomous tactical behavior in the context of reconnaissance mission scenarios.					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
FY 2009 Accomplishments: FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #2 Perception and Intelligent Control: Develop perception and intelligent control technologies required to meet objective capabilities for the armed robotic vehicles and to transition this technology to advanced development programs being conducted under PE 0603005A (Combat Vehicle Advanced Technology) project 515 for integration into test bed systems. Leverage Defense Advanced Research Projects Agency (DARPA) sponsored research for control of collaborating agents to enable mixed teams (manned/unmanned) to conduct military missions. In FY09, developed robotics technology that will permit unmanned vehicles to adapt to dynamic situations found in tactical environments. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010	4.722	0.000	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Base FY 2011 Plans: FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #3 UGV Integration: Integrate technology on unmanned ground vehicle (UGV) test beds and conduct extensive field testing and technology characterization to establish improved capability for near autonomous UGVs. Leverage algorithms being conducted under DARPA sponsored research, e.g., learning applied to ground robotics (LAGR). Conduct regular, periodic testing at Ft. Indiantown Gap, PA, and other military facilities that will test the technology in complex environments. The results of the tests will be used to further focus CTA sponsored research, assess performance, and provide the opportunity for US Army Training and Doctrine Command to engage in the early development of the tactics, techniques, and procedures required for successful utilization of unmanned systems in future conflicts. In FY09, evaluated the ability of unmanned ground vehicles to autonomously adapt to dynamic tactical environments. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO	3.987	0.000	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Accomplishments/Planned Programs Subtotals	15.929	0.000	0.000	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

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COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	Base FY 2011 Estimate	OCO FY 2011 Estimate	Total FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
H75: *ELECTRIC GUN TECHNOLOGY*	4.465	4.065	0.032	0.000	0.032	0.045	0.065	0.072	0.092	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project conducts applied research for Electromagnetic (EM) Guns. This project builds upon the EM Gun technology transitioned from PE 0601104A/Project H62 (Institute for Advanced Technology) and evaluates the potential of EM guns to provide such leap-ahead armaments capabilities that are fully integrated with electric propulsion and electromagnetic armor systems to provide the efficient, highly mobile, and deployable armored force. Focus is placed on addressing advanced materials for pulsed power; robust, compact, and lightweight launchers; full-scale, hypervelocity utility of novel kinetic energy penetrators (NKEPs) against a range of present and future threats; and efficient high energy launch packages. The results are transitioned to the Armament Research, Development, and Engineering Center (ARDEC), Picatinny Arsenal, New Jersey.In FY10 and beyond, applied research for EM Gun technology is redirected to conduct research to determine the effect of velocity and novel penetrator design on lethality, advanced propulsion concepts to achieve velocities above current ordnance velocities, and advanced energetics to increase penetrator performance. In FY11, this research will be funded under PE 0602618, Project H80.The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.Work in this project is performed by the Army Research Laboratory (ARL), Aberdeen Proving Ground, MD.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Program #1	1.742	1.880	0.000	0.000	0.000
EM Pulse Power: Evolve the high strength composite materials critical for compact pulsed alternators. In FY09, studied advanced materials (bandings, conductors, and switches) to reduce pulsed alternator size and mass. In FY10, investigate advanced propulsion concepts. In FY11, research effort transitions to PE 626128, Project H80. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Base FY 2011 Plans: FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #2 Launcher/Projectile: Research technologies needed to incorporate high strength, low density materials necessary for a long life, field-worthy EM cannon and develop lethal mechanisms that take advantage of the hypervelocity capability of EM guns and provide the armature and sabot technologies needed for accurate, low parasitic mass launch packages. In FY09, demonstrated large-caliber (>5 MJ) kinetic energy and multipurpose projectiles launched from an EM gun. In FY10, investigate advanced energetics to increase projectile performance, perform analysis of novel penetrator effects on advanced targets. In FY11, research effort transitions to PE 62618, Project H80. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO	1.400	1.601	0.000	0.000	0.000
Program #3	0.850	0.000	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Full-Scale Hypervelocity Lethality: In FY09, demonstrated full scale (>5MJ muzzle energy) reactive materials (RM) warhead and transitioned to ARDEC. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #4 EM Gun Analysis: In FY09, defined the guidance and control parameters needed to increase hypervelocity hit probability. In FY10, analyze and document the EM armament system technical barriers. In FY11, research effort transitions to PE 62618, Project H80. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base	0.473	0.509	0.032	0.000	0.032

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
OCO FY 2011 Plans: FY 2011 OCO					
Program #5 Small Business Innovative Research/Small Business Technology Transfer Programs *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO	0.000	0.075	0.000	0.000	0.000
Accomplishments/Planned Programs Subtotals	4.465	4.065	0.032	0.000	0.032

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

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COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	Base FY 2011 Estimate	OCO FY 2011 Estimate	Total FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
H80: *Survivability and Lethality Technology*	50.367	57.456	60.310	0.000	60.310	59.578	62.111	65.744	70.548	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project provides materials and armor/anti-armor terminal ballistic mechanisms that will provide better armor and armaments. Specific technology thrusts include: lightweight armors (Soldier/vehicle) and structures; active protection systems (APS); crew and component protection from ballistic shock, mine-blast; insensitive high energy propellants/munitions to increase lethality and reduce propellant/munitions vulnerability to attack; novel kinetic energy (KE) penetrator concepts to maintain/improve lethality; novel multi-function warhead concepts to enable defeat of full-spectrum of targets (anti-armor, bunker, helicopter, troops); and physics-based techniques, methodologies, and models to analyze combat effectiveness of future technologies for improved ballistic lethality and survivability. Work in this PE builds on the materials research transitioned from PE 0601102A (Defense Research Sciences): project H42 (Materials and Mechanics) and project H43 (Ballistics); and PE 0602105A (Materials Technology) and applies it to specific Army platforms and the individual Soldier. The work is related to and fully coordinated with efforts in PE 0602601A (Combat Vehicle and Automotive Technology), PE 0602786A (Warfighter Technology), PE 0603001A (Warfighter Advanced Technology), PE 0603004A (Weapons and Munitions Advanced Technology), PE 0603005A (Combat Vehicle Advanced Technology), and PE 0708045A (Manufacturing Technology).The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.Work in this project is performed by the Army Research Laboratory (ARL), Aberdeen Proving Ground, MD.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Program #1	11.808	12.128	12.890	0.000	12.890
Structural Armor: Optimize advanced lightweight structural, ceramic, and electromagnetic armor technologies for transition to current and future tactical and combat vehicle designers. In FY09, proved performance of passive armor designs (second generation) that defeat future tactical vehicle threats with further density reductions; validated objective threat defeat at goal vehicle weights; coupled modeling and simulation with ballistic characterization to validate third generation armor concepts for future threats. In FY10, confirm multi-hit capability of third generation armor concepts designed from emerging materials in PE 0602105/project H84 at goal weights against objective threats for vehicles. Validate Electrical Protection System (EPS) performance for tactical vehicles, both computationally and with tests in relevant environment. In FY11, will validate the					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
performance of third generation armor concepts under realistic environmental conditions through testing coupled with modeling and simulation. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #2 Mine Blast Protection: Develop mine blast, ballistic shock mitigation, and crew protection technologies to enable survivability of current and future platforms, ground tactical vehicles, and the individual Soldier. In FY09, devised models for mine protection using advanced-electromagnetic armor (A-EMA) and support validation of A-EMA mine kits; proved full-scale explosive loading with test apparatus to simulate vehicle borne or roadside blast fragment loading; transitioned second generation flexible protection equipment for individual Soldier development community. In FY10, analyze the ballistic shock effects of objective threat defeat on future vehicles. Computationally address the interaction of blast waves from objective blast threat with magnetic plate materials investigated in PE 0602105A/project H84. In FY11, will test and computationally validate advanced mine protection concepts at goal weights for threshold threat defeat and will prove performance under relevant environmental conditions.	3.550	4.012	3.844	0.000	3.844

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
FY 2009 Accomplishments: FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #3 Precision Munitions: Develop advanced technologies to enable a broad spectrum of affordable precision munitions. Develop a multi-disciplinary approach to munitions system design by coupling physics-based models of interior ballistics, launch dynamics, flight mechanics, and high-G guidance, navigation, and control (GN&C) technologies to enable smaller, cheaper, and lighter low-collateral-damage precision munitions for future asymmetric operations in military operations on urban terrain (MOUT). In FY09, addressed technology that enables precision fires for small unit MOUT operations. In FY10, validate reduced state GN&C methods that will significantly reduce cost of precision munitions. Validate low cost robust actuator technology for indirect fire application. In FY11, will show feasibility of non-GPS guidance technologies. Will provide technology assessment of precision hit technology across munition size and domain. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010	4.200	4.456	4.488	0.000	4.488

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Base FY 2011 Plans: FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #4 Energetics: Develop propulsion and energetics technologies. Evaluate, select, and validate novel/nanostructural insensitive energetic materials concepts that exploit managed energy release and are required for improving the effectiveness and reducing the vulnerability of future gun/missile systems and warheads. In FY09, applied ballistic modeling and simulation to evaluate low-vulnerability propulsion charge configurations at reduced caliber for MOUT and gun launched rockets; applied reactive materials and nano-structured materials to enhance energy output with less propellant and explosive material; derived and applied chemical and physical mechanisms to reduce erosion via dynamic nitriding; determined the effects of physical modification and compartment packing design of munitions on the vulnerability of propellants and explosives to fast and slow cook-off, bullet and fragment impact, shaped charge jet impact; evaluated performance of advanced enhanced blast explosive formulations and munitions. In FY10, provide technology assessment of reactive material as structural components for Army munition systems. Incorporate reactive materials into structural components for Army munition systems and test the performance of the system. Transition hypergolic rocket motor and understanding to RDECs. In FY11, will study green energetic material formulation and will study feasibility of replacing Hexahydro-Trinitro-Triazine (RDX). *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010	4.450	4.606	4.650	0.000	4.650

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Base FY 2011 Plans: FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #5 Advanced Munitions: Develop advanced ammunition and lethality technologies. Identify and model preferred options to reduce energy/mass required to defeat emerging armor threats and to provide multi-purpose capabilities for revolutionary future lethality. In addition, investigate technology options for scaling warhead lethality to enhance MOUT war fighting including control of collateral damage. In FY09, proved integrated scalable warhead technology for blast, fragmentation, and penetration effects in urban environments. In FY10, research advanced scalability concepts for medium and large caliber projectiles and missiles. In FY11, will conduct tests and document advances in scalable effects on targets. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO	3.575	3.863	3.800	0.000	3.800
Program #6	6.810	7.602	5.350	0.000	5.350

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Survivability/Lethality Analyses: Devise state-of-the-art survivability/lethality/vulnerability (SLV) methodologies to dynamically model the interaction of conventional ballistic threats versus future systems. In FY09, developed novel blast and combined-effects methodologies for non-traditional, emerging synergistic threats; demonstrated an early Modular UNIX-based Vulnerability Estimation Suite (MUVES) 3 analysis capability, and delivered advanced crew-casualty metrics for assessing body armor. In FY10, investigate alignment of methodology development to the coupling of emerging and predicted threats with advancing armor materials/recipes and medical community inputs. In FY11, will complete integration of ballistics effects into a system-of-systems context with other threat classes including electronic and information warfare. Perform improvements to tools, techniques, and methodologies for ballistic survivability/lethality analysis to ensure analysis tools are relevant and credible for developmental army systems using new lethality and survivability technologies. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #7 Armor Formulations: In FY09, researched and investigated composite ceramic materials (from PE 0602105A/ project H84) to increase body armor performance while reducing weight. For ground combat vehicles, designed and developed reactive armor and electromagnetic armor solutions for defeat of emerging kinetic energy (KE)	15.974	20.048	21.203	0.000	21.203

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
and chemical energy (CE) threats. Assessed new explosive materials for reactive armors (RA) with modeling, simulation, and tests to characterize performance as well as sensitivity. Conducted modeling and simulation and experiments of lightweight brass board electromagnetic (EM) armor solutions using advanced materials to include hybrid armor designs that provided dual threat protection capability. In FY10, continue composite ceramic materials investigations for personnel protection applications; conduct tests with candidate single and dual-threat (CE & KE) defeat armor components (RA and EM) to design vehicle armor concepts; conduct first proof of principle test with hybrid armor components (combines RA and EM technologies) for dual threat defeat; develop new test methodologies, diagnostics, and modeling and simulation tools to better support active and hybrid armor development. In FY11, will determine and refine candidate dual threat defeat armor solution candidates for maturation in PE 0602601A/project C05; will validate the testing and computational tools that will be used to design and develop active and hybrid armors concepts and prove the feasibility of using a hybrid armor in a multi-threat scenario with component level proof of principle testing in relevant environments. Personal protection concepts will utilize material technologies from PE 0602105A/projects H84/H7G and will be assessed and refined in PE 0602786A/project H98. Reactive armor and electromagnetic armor design solutions will utilize material technologies from PE 0602105A/project H84 and be assessed and refined in PE 0602601A/project C05. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #8	0.000	0.000	4.085	0.000	4.085

Exhibit R-2A, PB 2011 Army RDT&E Project Justification		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602618A: *BALLISTICS TECHNOLOGY*	PROJECT H80: *Survivability and Lethality Technology*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Penetrator Lethality research. This research effort is transitioned from PE62618 Project H75. In FY11, will validate effects on lethality of velocity - ranging from ordnance velocity to hypervelocity - and also the effect of novel penetrator designs. Will complete validation and assessment of benefits of novel penetrator effects at ordnance velocity, will conduct initial validation of most promising novel penetrator designs at hypervelocity, and will improve penetration and lethality models based on novel penetrator data. Will investigate advanced propulsion system concepts to achieve velocities above current ordnance velocities. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #9 Small Business Innovative Research/Small Business Technology Transfer Programs *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010	0.000	0.741	0.000	0.000	0.000

Exhibit R-2A, PB 2011 Army RDT&E Project Justification		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602618A: *BALLISTICS TECHNOLOGY*	PROJECT H80: *Survivability and Lethality Technology*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Base FY 2011 Plans: FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Accomplishments/Planned Programs Subtotals	50.367	57.456	60.310	0.000	60.310

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, PB 2011 Army RDT&E Project Justification			DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602618A: *BALLISTICS TECHNOLOGY*	PROJECT HB1: *SURVIVABILITY AND LETHALITY TECHNOLOGIES (CA)*	

COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	Base FY 2011 Estimate	OCO FY 2011 Estimate	Total FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
HB1: *SURVIVABILITY AND LETHALITY TECHNOLOGIES (CA)*	14.066	16.513	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

These are Congressional Interest Items

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Program #1	3.989	0.000	0.000	0.000	0.000
Laser Based Explosives and Chem/Bio Standoff and Point Detector. This Congressional Interest Item Investigated laser-based approach for detection of unknown substances in the field for military and First Responder applications *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #2	0.797	0.795	0.000	0.000	0.000

Exhibit R-2A, PB 2011 Army RDT&E Project Justification		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602618A: *BALLISTICS TECHNOLOGY*	PROJECT HB1: *SURVIVABILITY AND LETHALITY TECHNOLOGIES (CA)*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Beneficial Infrastructure for Rotorcraft Risk Reduction Demonstrations (BIRRRD). In FY09, Investigated Vehicle Management System (VMS) to support combat medic unmanned aerial vehicle applications *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #3 Small Unmanned Aerial Vehicles (UAVs) and Sensors. In FY09, this Congressional Interest Item investigated vehicle technology that can be used to support Reconnaissance, Intelligence, Surveillance, and Target Acquisition on small military Unmanned Aerial Vehicles, using penetrating radar to search buildings and structures. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base	0.498	0.000	0.000	0.000	0.000

Exhibit R-2A, PB 2011 Army RDT&E Project Justification		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602618A: *BALLISTICS TECHNOLOGY*	PROJECT HB1: *SURVIVABILITY AND LETHALITY TECHNOLOGIES (CA)*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
OCO FY 2011 Plans: FY 2011 OCO					
Program #4 Super High Accuracy Range Kit - 105mm Artillery Technology. In FY09, this Congressional Interest Item investigated an accuracy improvement technology for application to artillery ammunition through the use of GPS and an electro-mechanical control actuation system. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO	3.592	3.979	0.000	0.000	0.000
Program #5 Advanced Composite Armor For Force Protection. In FY09, this Congressional Interest Item investigated advanced composite materials tailored to defeat evolving ballistic and IED fragmentation threats. *FY 2009 Accomplishments:* FY 2009	1.597	1.592	0.000	0.000	0.000

Exhibit R-2A, PB 2011 Army RDT&E Project Justification		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602618A: *BALLISTICS TECHNOLOGY*	PROJECT HB1: *SURVIVABILITY AND LETHALITY TECHNOLOGIES (CA)*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
FY 2010 Plans: FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #6 Next Generation Lightweight Electric Drive Systems for Army Weapons. In FY09, this Congressional Interest Item developed software for the analysis of the electric drive and transitioned it to Dakota Power. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO	1.597	0.000	0.000	0.000	0.000
Program #7 Eye-Safe Standoff Fusion Detection of CBE Threats. In FY09, this Congressional Interest Item researched eye-safe standoff detection approaches for chemical, biological, and explosive theats.	1.996	1.990	0.000	0.000	0.000

Exhibit R-2A, PB 2011 Army RDT&E Project Justification		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602618A: *BALLISTICS TECHNOLOGY*	PROJECT HB1: *SURVIVABILITY AND LETHALITY TECHNOLOGIES (CA)*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
FY 2009 Accomplishments: FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #8 5.56mm Aluminum Cartridge Case, Lake City Army Ammunition Plant. This is a Congressional Interest Item. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO	0.000	1.592	0.000	0.000	0.000
Program #9	0.000	0.796	0.000	0.000	0.000

Exhibit R-2A, PB 2011 Army RDT&E Project Justification		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602618A: *BALLISTICS TECHNOLOGY*	PROJECT HB1: *SURVIVABILITY AND LETHALITY TECHNOLOGIES (CA)*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Flexible Solar Cell for Man Portable Power Generator. This is a Congressional Interest Item. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #10 Direct Carbon Fuel Cell. This is a Congressional Interest Item. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO	0.000	2.785	0.000	0.000	0.000

Exhibit R-2A, PB 2011 Army RDT&E Project Justification		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602618A: *BALLISTICS TECHNOLOGY*	PROJECT HB1: *SURVIVABILITY AND LETHALITY TECHNOLOGIES (CA)*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Program #11	0.000	2.984	0.000	0.000	0.000
Enabling Optimization of Reactive Armor. This is a Congressional Interest Item. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Accomplishments/Planned Programs Subtotals	14.066	16.513	0.000	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.